CLAIMS

What is claim is:

1. A light-emitting diode device, said light-emitting diode device comprising:

a substrate;

a multi-layer compound semiconductor structure having a rhombus shape on said substrate, wherein one pair of parallel sides of said rhombus shape are parallel to a easy crack direction of said substrate; and

a first electrode and a second electrode on two ends of the longer diagonal of said rhombus shape respectively.

2. The light-emitting diode device according to claim 1, wherein said substrate comprises a sapphire substrate.

3. The light-emitting diode device according to claim 1, wherein said multi-layer compound semiconductor structure comprises:

a first doped semiconductor layer with a first conductivity type on said substrate;

an active light-emitting layer on said first doped semiconductor layer;

a second doped semiconductor layer with a second conductivity type on said active light-emitting layer;

a transparent conductive layer on said second doped semiconductor

layer;

trench on one end of the longer diagonal of said rhombus shape, said trench has a predetermined depth in said first doped semiconductor layer to accommodate said second electrode to connect said first doped semiconductor layer, and expose a portion of said second doped semiconductor layer, a portion of said active light-emitting layer and a portion of said first doped semiconductor layer; and

a dielectric layer covering said transparent conductive layer, said exposed portion of said second doped semiconductor layer, said exposed portion of said active light-emitting layer and said exposed portion of said first doped semiconductor layer to isolate said first electrode and said second electrode.

4. The light-emitting diode device according to claim 3, wherein said first doped semiconductor layer and said second doped semiconductor layer comprise III-V group semiconductor layers.

5. The light-emitting diode device according to claim 3, wherein said first doped semiconductor layer and said second doped semiconductor layer comprise doped GaN semiconductor layers.

6. The light-emitting diode device according to claim 3, wherein said dielectric layer comprises a silicon dioxide layer.

7. The light-emitting diode device according to claim 3, wherein said dielectric layer comprises a silicon nitride layer.

8. The light-emitting diode device according to claim 3, wherein said dielectric layer comprises a transparent polymer layer.

9. The light-emitting diode device according to claim 3, wherein said first doped semiconductor layer and said second doped semiconductor layer comprise a N type doped semiconductor layer and a P type doped semiconductor layer.

10. The light-emitting diode device according to claim 1 further comprises two bumps formed on said first electrode and said second electrode respectively for flip chip package processes.

11. The light-emitting diode device according to claim 1 further comprises two bumps formed on said first electrode and said second electrode respectively for surface mounting technologies.

12. The light-emitting diode device according to claim 1 further comprises adhesive conductive films on said first electrode and said second electrode respectively for flip chip package processes.

13. The light-emitting diode device according to claim 1 further comprises

adhesive conductive films on said first electrode and said second electrode respectively for surface mounting technologies.

14. A method for forming a light-emitting device, said method comprising:

providing a substrate;

forming a first doped semiconductor layer with a first conductivity type on said substrate;

forming an active light-emitting layer on said first doped semiconductor layer;

forming a second doped semiconductor layer with a second conductivity type on said active light-emitting layer;

forming a transparent conductive layer on said second doped semiconductor layer;

transferring a plurality of first electrode patterns of a plurality of first rhombus patterns into said transparent conductive layer, said second doped semiconductor layer, said active light-emitting layer and a predetermined depth of said first doped semiconductor layer, wherein each said first electrode pattern is on one end of the longer diagonal of each said first rhombus pattern, and at least one side of said first rhombus pattern is parallel to a easy crack direction of said substrate;

forming a dielectric layer over said substrate;

transferring a plurality of said first and second electrode patterns of a plurality of second rhombus patterns into said dielectric layer to expose a portion of said transparent conductive layer and said first doped

semiconductor layer, wherein each said first and said second electrode patterns are respectively on two ends of the longer diagonal of each said second rhombus pattern, and at least one side of said second rhombus pattern is parallel to a easy crack direction of said substrate;

forming a plurality of first electrodes and second electrodes on said exposed first doped semiconductor layer and said exposed transparent conductive layer; and

dividing said substrate along said easy crack direction to form a plurality of devices having a rhombus shape.

15. The method according to claim 14, wherein said substrate comprises a sapphire substrate.

16. The method according to claim 14, wherein said first and said second doped semiconductor layers are formed by a Metal Organic Chemical Vapor Deposition process.

17. The method according to claim 14, wherein said first and said second doped semiconductor layers are formed by a molecular beam epitaxy method.

18. The method according to claim 14, wherein said first and said second doped semiconductor layers comprise doped GaN semiconductor layers.

19. The method according to claim 14, wherein said dielectric layer comprises a silicon dioxide layer.

20. The method according to claim 14, wherein said dielectric layer comprises a silicon nitride layer.

21. The method according to claim 14, wherein said dielectric layer comprises a transparent polymer layer.

22. The method according to claim 14, wherein said first doped semiconductor layer and said second doped semiconductor layer comprise a N type doped semiconductor layer and a P type doped semiconductor layer.

23. The method according to claim 14, wherein said first doped semiconductor layer and said second doped semiconductor layer comprise III-V group semiconductor layers.

24. The method according to claim 14 further comprises a step of forming two bumps on said first electrode and said second electrode respectively for flip chip package processes.

25. The light-emitting diode device according to claim 14 further comprises a step of forming two bumps on said first electrode and said second electrode respectively for surface mounting technologies.

26. The light-emitting diode device according to claim 14 further comprises a step of forming adhesive conductive films on said first electrode and said second electrode respectively for flip chip package processes.

27. The light-emitting diode device according to claim 14 further comprises a step of forming adhesive conductive films on said first electrode and said second electrode respectively for surface mounting technologies.